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Paleopsychoda zherikhini, a new Cretaceous species of moth flies from Taimyr amber (Diptera: Psychodidae: Psychodinae)

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ABSTRACT

Paleopsychoda zherikhini sp. n. is described from the mid-Cretaceous amber of Taimyr (Siberia, Russia). The discovery of this psychodid fly shows a broad distribution of this genus in the Early and Late Cretaceous and improves our knowledge of the biodiversity and the evolution of moth flies.

KEY WORDS: Insecta, Diptera, Psychodidae, new species, Late Cretaceous, Russia, Siberia, Taimyr, Zhdanikha, amber.

INTRODUCTION

The genus *Paleopsychoda* includes three species, *P. solignaci* Azar *et al*., 1999, *P. jacquelinea* Azar *et al*., 1999 and *P. inexpectata* Azar & Nel, 2002, from the Lebanese Lower Cretaceous amber. Phlebotomine-like mouthparts suggest that members of this extinct genus were probably blood feeders.

The studied material comes from the locality of Zhdanikha, which is on the left bank of the Khatanga River, 1 km upstream of its mouth, Taimyr Peninsula, Western Siberia, Russia (Fig. 1). The fossil resin has been collected from the middle part of the Begichev Formation. The *History of Insects* (Eskov 2002: 444) reports that the arthropod inclusions

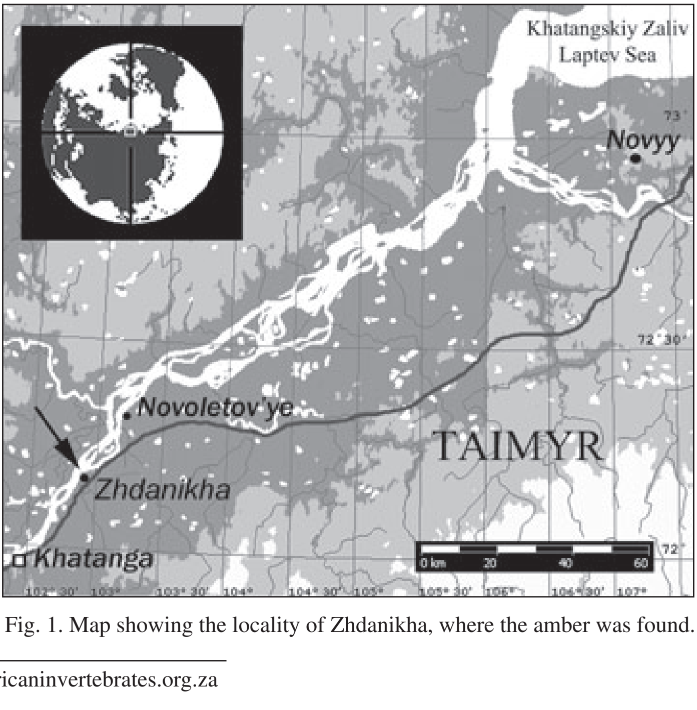

Fig. 1. Map showing the locality of Zhdanikha, where the amber was found.

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in this amber have been discovered in four localities in the Khatanga River basin (Eastern Taimyr). The Begichev Formation of the mid-Cretaceous (Albian to Early Cenomanian) age is represented by the fluvial and deltaic sands with lenses of lignitised wood containing the retinite. Although inclusions in this amber are relatively rare, over 40 arthropods have been found, representing seven orders, with the Diptera being dominant (Zherikhin & Sukatsheva 1973; Zherikhin 1978).

Below, we follow the wing venation nomenclature of McAlpine (1986) and the nomenclature of genital appendages proposed by the Computer-aided Identification of Phlebotomine Sandflies of America (CIPA group project, University of Paris-6, Jussieu), available on the web site http://cipa.snv.jussieu.fr. The type material of the newly described species is deposited in the Paleontological Institute, Russian Academy of Sciences, Moscow.

TAXONOMY

Family Psychodidae Bigot, 1854

Subfamily Psychodinae ?

Genus *Paleopsychoda* Azar *et al.*, 1999

Type species: *Paleopsychoda solignaci* Azar *et al.*, 1999.

Other species: *P. jacquelinea* Azar *et al.*, 1999; *P. inexpectata* Azar & Nel, 2002; *P. zherikhini* sp. n.

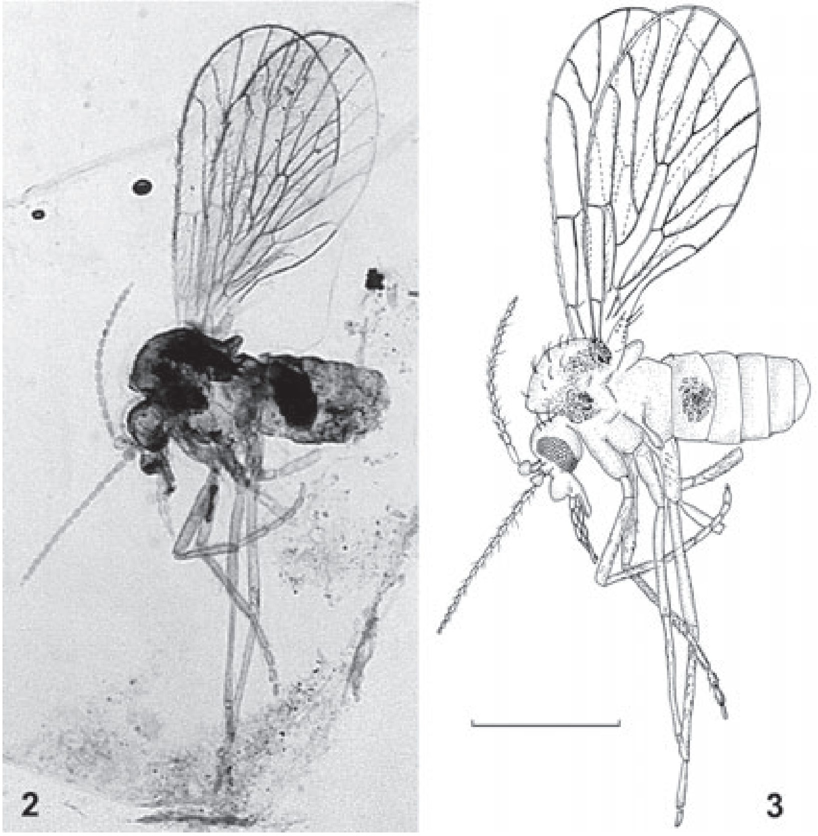
Paleopsychoda zherikhini sp. n.

Figs 2–10

Etymology: In memory of Prof. Vladimir Zherikhin, who was a friend of the senior author and a great authority in palaeoentomology.

Diagnosis: Eyebridge incomplete. Mouthparts well developed and phlebotomine-like. Maxillary palp 4-segmented, with last palpomere twice as long as others. Third and fourth palpomeres with secondary annulations over their entire length. Antenna with 15 flagellomeres, the last one being reduced and drop-like.

Description: Mouthparts well developed, equal in length to head (Figs 4–7), palp 0.45 mm long, with four palpomeres. Eyes forming weak and incomplete eyebridge, separated by distance of 0.125 mm. Antenna 0.675 mm long, with 15 flagellomeres. First flagellomere nearly twice as long as others and terminal flagellomere reduced and drop-like. Scape cylindrical, 0.055 mm long and 0.035 mm wide. Pedicel nearly globular, about 0.045 mm long and wide. All flagellomeres bearing curved setae. Wing 1.2 mm long, 0.55 mm wide, hyaline (Fig. 8). Humeral vein reaching costal margin at 0.125 mm from wing base. Subcostal vein (Sc) distally fused with R1 at almost right angles, 0.465 mm from wing base, and with crossvein reaching costal margin. R1 reaching costal margin 0.885 mm from wing base. Rs separated from R1 at 0.335 mm from wing base, 0.09 mm basad of M1+2 and M3 fork. Rs four-branched, with all its branches extending to wing margin. Rs bifurcating into R2+3 and R4+5 0.45 mm distad of wing base. R2 and R3 separating 0.85 mm distally. R4 and R5 separating 0.175 mm distad of R2+3 base. R4 curved. R5 with strong angle in its basal part and distally very slightly curved. Crossvein r–m 0.635 mm distad of wing base. M1+2 and M3 diverging 0.275

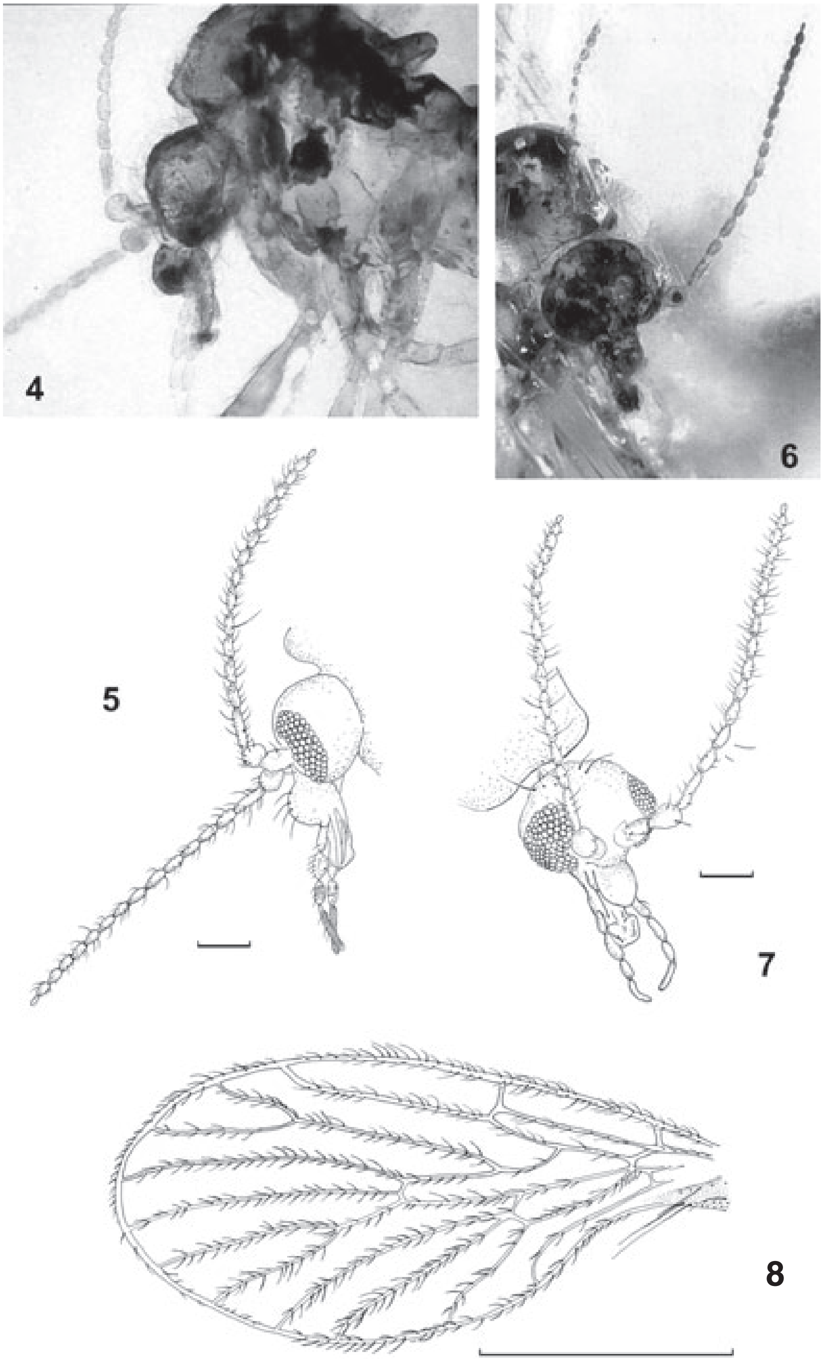


Figs 2, 3. *Paleopsychoda zherikhini* sp. n., holotype no. 3308/13: (2) general appearance, (3) details of body structure. Scale bar 0.5 mm.

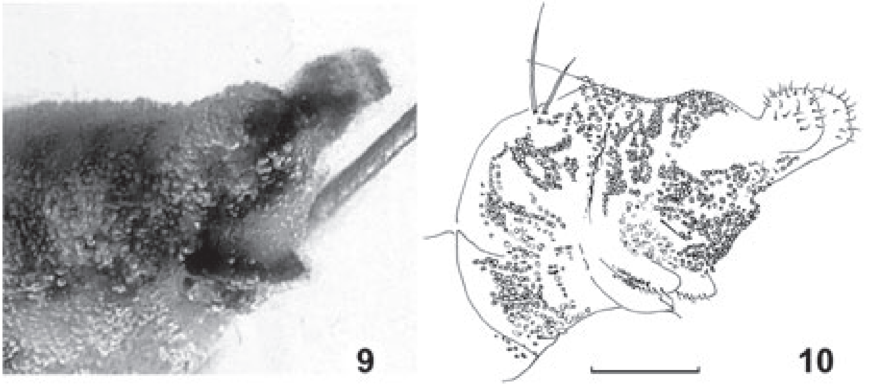
mm distad of arculus. M1 and M2 bifurcating 0.36 mm distad of M1+2 base. M1 distally nearly straight. M2 slightly shorter than M1. M3 reaching wing margin at nearly 0.8 mm from wing base. CuA1 separating from CuA 0.395 mm distad of wing base. CuA2 rather developed, curved distally, 0.24 mm long. A1 well developed and reaching posterior wing margin. All main veins and wing margin bearing long macrotrichiae. Halteres 0.18 mm long. Knob 0.06 mm long and 0.025 mm wide. Stem 0.12 mm long. Thorax 0.5 mm long, 0.45 mm high. Pronotum gibbous with its upper surface bearing few long setae. Legs very long, distinctly longer than entire body. Abdomen 0.48 mm long excluding genital appendages, 0.31 mm wide. Dorsal surfaces of all abdominal segments bearing few setae. Female genital appendages (Figs 9, 10) covered by a thin layer of small gas bubbles but nevertheless discernable. Subgenital plate elongate, 0.085 mm long. Cerci rounded, 0.055 mm long and 0.06 mm wide. Subgenital plate and cerci bearing fine and dense setae.

Holotype: specimen no. 3308/13, sex unknown; locality of Zhdanikha; mid-Cretaceous, Begichev Formation.

Paratypes: specimens no. 3308/14, sex unknown, and no. 3308/15, female, from the same locality and horizon as the holotype.



Figs 4–8. *Paleopsychoda zherikhini* sp. n.: (4, 5) holotype no. 3308/13: (4) head and thorax in lateral view, (5) structural details of head, lateral view; (6, 7) paratype no. 3308/14: (6) head, (7) structural details of head, frontal view; (8) wing details of holotype no. 3308/13. Scale bars 0.1 mm in Figs 5, 7 and 0.5 mm in Fig. 8.



Figs 9, 10. Female genitalia of *Paleopsychoda zherikhini* sp. n., paratype no. 3308/15: (9) ventro-lateral view, (10) details in ventro-lateral view. Scale bar 0.5 mm.

DISCUSSION

Paleopsychoda zherikhini shares with all other species of this genus general features like the incomplete eyebridge, mouthparts well developed and phlebotomid-like, and antenna with 15 flagellomeres, the last one being reduced and drop like. These characters allow us to attribute *P. zherikhini* to *Paleopsychoda*.

The new species differs from its congeners in having shorter antennae and in the distance between the R2+3 fork (into R2 and R3) and the M1+2 fork (into M1 and M2). In *P. solignaci*, *P. jacquelinea* and *P. inexpectata* this distance is null whereas in *P. zherikhini* the R2+3 fork is more apical. *P. zherikhini* has a developed CuA2 like *P. solignaci*, this vein being longer in *P. jacquelinea* and shorter in *P. inexpectata*. M3 and CuA1 meet at one point in *P. zherikhini* and *P. solignaci*, whereas they are merged for a small distance in *P. jacquelinea*. In *P. inexpectata*, M3 and CuA1 do not meet at all, but there is a small crossvein between them. R2 is nearly half as long as R3 in *P. zherikhini* and *P. inexpectata*; it is slightly longer than one-third of R3 in *P. solignaci*, and it is nearly equal to R3 in *P. jacquelinea*.

Azar *et al*. (1999: 1111) attributed the genus *Paleopsychoda* to the Psychodinae and they integrated it in a cladistic phylogeny (Azar *et al*. 1999: 1131) mainly based on the phylogenetic analysis of Hennig (1972). Nevertheless, they were uncertain of their systematic attribution: "The only uncertainties concern the genera *Phlebotomites* and *Paleopsychoda*, which appear in unresolved polytomies because we failed to define any autapomorphies for these genera" (Azar *et al*. 1999: 1132). Even if the genus *Paleopsychoda* shares a lot of characters with the Psychodinae, its systematic position within the Psychodoidea remains debatable and it demonstrates that the phylogenetic history of this peculiar group is clearly more complicated than what one could expect.

CONCLUSIONS

Paleopsychoda species were originally found in the Early Cretaceous Lebanese amber, which is of Gondwanaland origin. The discovery of *P. zherikhini* in the Laurasian Albian/Cenomanian Taimyr amber indicates that this genus survived at least 25 to 35 My and provides interesting information on its wide distribution during the Cretaceous. The finding of a new species belonging to the genus *Paleopsychoda* in the Taimyr amber greatly increases our knowledge about biodiversity of psychodids in general and this genus, in particular.

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